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THE RELATION OF TECHNICAL TRAINING TO APPLIED ENTOMOLOGY IN THE COMMERCIAL FIELD*

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The topic which I am to discuss was not of my own choosing but was assigned to me by your program committee. This is my alibi and I just wanted you to know whom to blame. I am assuming the program committee referred to training for service as pest control operators, commonly called exterminators, although the title assigned might include other fields. Interpreting the subject my own way, I decided to outline very briefly the fields of entomology as vocations and then specifically discuss the field of the pest control operator, the training which the professional operator should have, and the relation of the technical entomologist to the commercial pest control operator.

Perhaps few of us realize the increasing scope and opportunities in our profession during recent years. We are all aware that the number of persons following entomology as a vocation has increased conspicuously during the past two decades. Is this due to failure of the results of past research, requiring renewed and greater efforts, or are there more kinds of insects attacking our properties, or are there other factors involved. To be sure some insects new to America have been introduced in recent years, but this in itself does not account for the increasing need for entomological work. Nor can we say that the studies of the past have not been responsible for efficient controls. Doubtless, there are many and varied reasons for the increasing demand for entomological service. First of all, the public is more insect-minded and is realizing more and more the need of insect control and as a result is demanding more service from the experiment stations and the federal governments. Second, preventive and control measures which were once effective and practical have become obsolete in many cases because of changed farm practices. Third, regulatory measures have been very significant factors. Thus we have regulations in some states prohibiting the use of certain materials which necessitates research for substitutes; spray residue tolerances have made necessary enlarged programs for a study of cleaning methods and insecticide substitutes; insect contamination of canned and dried fruits and vegetables is now prohibited, even a spine or seta of an insect being considered adulteration, thus necessitating insect control of very high efficiency; and finally we now learn that insect excrement also constitutes adulteration and since insect excrement in flour, for example, is practically impossible to remove by the methods usually employed to screen out insects themselves, it becomes paramount that millers provide more complete insect control. When we further recall that each year brings to us additional insects responsible for the carriage of plant and animal diseases, it is not difficult to understand the ever increasing demand for insect control service and to realize that we may anticipate an increasing demand for years to come.

For many years there have been some opportunities for trained entomologists as instructors, especially in agricultural colleges, and occasional opportunities in museums. However, the principal field open to those majoring in entomology has been in the field of research with federal or dominion and state

*Paper read at the Ottawa meeting of the American Association for the Advancement of Science, 1938.

or provincial laboratories. During recent years there have been increasing opportunities for men trained for entomological research or sales promotion with commercial manufacturers of insecticides and insecticide appliances. The evident need of securing more general adoption of insect controls developed by the researcher has been responsible for the extension entomologist, and this type of activity has been so successful that we may well anticipate a continued demand for those trained for extension work. But perhaps one of the most promising of the newer fields calling for men with adequate training in entomology is commercial insect control service. By this we include especially pest control in buildings, including business houses, warehouses, hotels, apartment houses and individual homes. It may also include treatment of growing crops, especially shade trees and shrubs, to protect them from insect damage. Furthermore, there appears to be a likely field for trained entomologists as private consultants and investigators for individuals and manufacturers.

There are pest control operators whose firms date back fifty years, so we must assume that commercial pest control, referring primarily to the control of insects and other animal pests in buildings, especially in cities, has existed at least half a century. So far as we are able to determine, these early exterminators, as they have been commonly referred to, were honest and fairly successful in their work. As the public became more and more aware of the seriousness of insects, their destructiveness, and as carriers of human disease, there were increasing demands for pest control service. With this increasing demand more persons entered the field of pest control service and with the publicity, or perhaps I should say the notoriety given the termite problem, many more persons, the majority untrained and unfitted, entered the field. Today we have a situation which requires action and very drastic action if we are to uphold the science of entomology and maintain the dignity of reputable pest control operators. First, we must have state laws which will control the industry just as much as laws which control the medical and other important professions. Second, the operator of the future must be ethical and honest, as well as an able operator, and I know of nothing more inducive to honesty and fair play than education. By education, I do not necessarily mean a four year course in college, for I can well see how one might become an efficient and reputable operator through apprenticeship or otherwise. Third, there must develop an *esprit de corps* among trained operators themselves and between such operators and technical entomologists. The entomologist has too long ignored the pest control operator, and the latter has failed to make use of the service provided by the entomologist.

The future field for commercial operators is certain to be among the professions, requiring knowledge and honesty, and I believe I can add, an ethical attitude comparable with the higher professions. The professional pest control operator must be one who can be entrusted with the problems affecting human beings and their earthly possessions, just as much as the public now entrusts its destiny with the "family" physician. This change can be brought about only by education of operators to an appreciation of ideals as well as the technique of controls, and this will require the wholesome co-operation of professional entomologists in the field of teaching, research and extension.

Educational Requirements. First of all the commercial pest control operators must get away from the idea that the industry or profession of pest control is a mysterious subject. Rather must they realize that theirs is a profession which requires a scientific and technical training, together with training which will provide the practical application and use of technical training. The public must realize that the operator provides a service of great importance which is just as technical and as ethical as that of the medical authority, the attorney or the chemical or bacteriological technician.

Training for the pest control service should require a complete four-year college curriculum in entomology, including the introductory courses, taxonomy, morphology, physiology and economics, as well as training in chemistry and the various other subjects in the fields of biological and social sciences necessary to a well-rounded education. In addition, just as the present day technical entomologist needs graduate work, so does the pest control operator need practical experience to develop and utilize his technical training. While we do give students showing a special interest in the pest control service some practical experience, it is as yet inadequate, and graduates must depend to a large extent on service with reputable established businesses.

Co-operation of Entomologists and Pest Control Operators. One pest control operator wrote me as follows: "There is a feeling that entomologists might in some manner overshadow commercial pest control operators." Let us analyze this statement. An entomologist is one who is interested in and who makes a study of insects. Those who study insects, as they are of importance as destructive or beneficial forms, are known as economic entomologists. Then it is obvious that a properly trained pest control operator is in reality an economic entomologist, whether he received his training in college or from practical experience. There should be no conflict between the college-trained man and the apprenticeship-trained man; indeed, there should be complete co-operation. As I see it, those who fear competition with the college-trained man are perhaps those who lack the fundamentals of their vocation or those who are not interested in continuing their study from year to year, which is so essential in a field where new problems and new ideas are so continuous. The majority of present day pest control operators or exterminators received their training by actual experience and perhaps comparatively few of these attempt to keep up with published papers in the field of entomology. However there is certain to be a changed situation in the future because persons receiving training in entomology as a vocation are recognizing the possibilities of commercial pest control, and we can anticipate an increasing number of entomologically trained men entering this field of work. This, in turn, will stimulate the better operators to more carefully study their problems and I believe there will be a gradual elimination of those operators not properly equipped for their work.

Our observations during the past few years lead us to predict that the pest control industry, which has been hampered by many incompetent and unscrupulous individuals, will in a comparatively few years emerge from the present chaotic condition into an industry of professional standing. My contacts show definitely that we as entomologists can be of real assistance to the pest control operators and thus raise the standards of the industry which after all is an important line of work in the field of economic entomology.

Until recent years pest control operators worked largely as individuals with no national organization. In 1934 the National Association of Exterminators and Fumigators (now National Pest Control Association) was organized. This organization has sponsored an annual convention, not a small part of which has been given over to an educational program, and largely through the untiring efforts of Wm. O. Buettner, the association has grown both in numbers and usefulness. It already has done much to improve the ethics of the industry and instill in its membership a spirit of co-operation.

In January, 1937, at the request of a number of pest control operators, we inaugurated a five-day conference at Purdue University. The value of such a conference was so evident that a second conference was held in January, 1938, at which 103 persons from twenty-two states and Canada attended. Half or more of the time of the conference was given over to fundamentals and the remainder to clinics on individual problems. These fundamentals included insect mor-

phology and physiology with emphasis on the relation of structures and their functions to insect control, identification of immature and mature insects, and principles of insect control. A similar conference was held in California at Stanford University the last of March this year. These conferences have developed a spirit of co-operation among those present and have stimulated in them a desire to learn more about the problems of their industry and related fields of entomology. They realize that a knowledge of entomology in general is an asset of immeasurable value. If such conferences do nothing more than instill a desire to read and keep up with latest developments, they will be worth while. Entomology is a comparatively new science and the amount of new information being made available in bulletins, journals and books is enormous, and only by keeping up with these developments can the entomologist, whether a technical or a commercial worker, maintain the best service.

Some of the pest control operators have questioned the advisability of college graduates majoring in entomology entering the commercial field of pest control. It is true that very few men just out of college have the practical experience, so important in this service work, and until colleges can provide such practical training, entomologists planning to enter this field of work should seek employment with a reputable established firm and should continue this apprenticeship for one or preferably two years. If he is the right type of man and his services are of appreciable value to the company, it is likely he will be given an opportunity to continue with the company with compensation comparable with his service. If he finds it to his advantage to engage in business for himself or in partnership with another, he should maintain the confidence of his former employer and should not attempt to take over clients of the latter by price cutting or other unfair means.

In concluding I would urge entomologists to maintain a contact with pest control operators in their territory, give assistance wherever possible, and as opportunity permits carry on research in the field of household insects which has been much neglected in the past.

A PLEA FOR PRESERVATION OF THE SOUTH POINT OF PEELE ISLAND AS A WILD-LIFE-STUDY PRESERVE

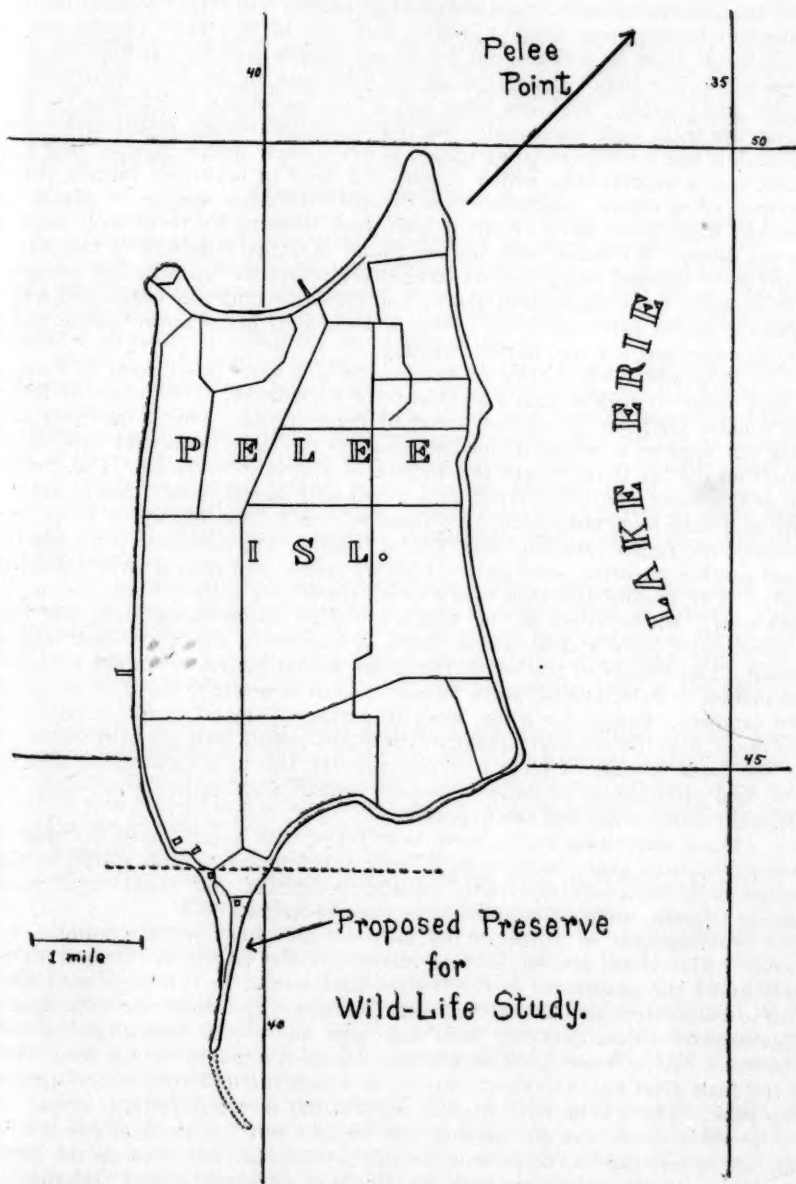
BY CLARENCE HAMILTON KENNEDY,

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My reason for asking scientific men in Canada to do something for their own future good is somewhat selfish. For eighteen summers I have taught classes in entomology at the Franz Theodore Stone Laboratory on Gibraltar Island at Put-in Bay, Ohio. This is a department of the Ohio State University definitely devoted to a study of the aquatic resources of Lake Erie and associated waters. It is now supported jointly by the University and the Division of Wild-Life Conservation of the State of Ohio. The adjoining Federal Whitefish Hatchery has been turned over to Ohio and it and the State White-Fish Hatchery have been turned over for research purposes to the Franz Theodore Stone Laboratory administration. Five men are now on the permanent year-round research staff of the institution.

In our study of the insects of this region, boats carry classes to all the local islands including the three Sisters, North, Middle and South Bass, Kelly's, Middle and Pelee, besides the minor islands, reefs and the south shore. We have come to depend on gasoline rather than on books. We find the richest collecting area, as far as land insects and certain shore insects are concerned, to be the sandy point on the south end of Pelee Island. This is a two-mile long miniature of big Pelee Point so we know that area also. Big Pelee Point was the finest subirrigated sand-spit on Lake Erie. It even contained a mile-

PLATE 16



Road map of Pelee Island, Essex Co., Ontario. The area south of the dotted line is the part the preservation of which as a wild life park is proposed.

long strip of white pine which is absent on the smaller sand-spit on Pelee Island. The magnificent ten-mile beach attracted picnickers and finally tourists until the Canadian Government made a tourist park out of it. They cleared out the underbrush, built good roads, put police and guards in charge, and let the birds, bugs and native plants struggle along on their own in the face of automobiles, camps and tourists. Eighteen years ago it was one of the finest areas for birds along the lakes and was equally fine for many interesting plants and insects. Because it was a sand-spit subirrigated, it never knew severe drouth. Big Pelee Point was a natural trap which caught and held in luxuriant form a curious mixture of northern, southern, western and sand-dune species of plants and insects. Eight years ago I visited it with three students for three days' work on its ant fauna. We found ants but we found so many hundreds of campers, so many acres brushed clear that we have never returned. Its wild life is ruined. The campers have magnificent shade, ten miles of wonderful beach and several square miles of nice soft sand. Tens of thousands get pleasure where only a few scientists might have enjoyed roaming.

After seeing the Georgian Bay region and some other parts of Canada, I have come to believe that Canadians are born lucky. One piece of luck is the smaller sand-spit on the south end of Pelee Island. This is only two miles long but appears to retain in smaller amounts the same fauna and flora as that found on the big Point except for the lack of a white pine forest. The growing tip of this lesser point is covered with a half mile of red cedar. Along the west side is a mile-long sand plain one hundred yards wide on which is an open forest of the rather rare hop tree, *Thelia trifolia*. On this same plain are scattered patches of cactus, sand cherry, fragrant sumac and several sand-inhabiting herbs. The middle and base of the point contains a forest of oak, beech, and hackberry. In the edges of the woods are dead dunes about eight feet high. Between sand plain and woods are zones of bear-berry, dwarf yew and fragrant sumac. The beauty of the whole two miles is that sand beaches are a drug on the market in Pelee Island; autos cannot cross in summer, so it is free of tourists and campers. Except for a few loads of garbage dumped in this lovely place, the point is in its original primitive condition. Bird men go wild when they see the great number of birds that pass through this area each spring and fall. The long sand bar at its point is usually covered with gulls, terns, herons and the many lesser snipe and sandpipers.

Many interesting insects have been taken such as the snout butterfly, an earwig, the little green walking stick, sand grasshoppers, several species of tiger beetles and numerous mutillids, scoliids, pompilids and other sand wasps. Among Diptera, robber flies and bee flies are abundant.

Among ants it is one of the northernmost spots for the minute, very speedy *Iridomyrmex analis*, a close relative of the Argentine ant. This ant nests under the grass roots in the hottest sand areas. In this same sand plain, with a temperature of 120° or more on the surface, are found the deep nests of *Aphenogaster treatae*, another sand ant, also nests of *Formica pallide-fulva schaufussi*. As a house guest near other ant nests we find here a new species of the little thief ant, *Solenopsis rosella*, in which the abdomen of the queen is rosp pink. The *Thelia* trees contain nests of the rare *Camponotus caryae*. In the woods in rotten oak stumps and logs we took our first nests of *Proceratium silaceum*, a very rare ant at present, because few logs are left to rot in the correct humidity. In the woods we find also the very curious, almost microscopic, *Strumigenys pergandei*. *Strumigenys* feeds on Collembola.

My plea is that some Canadian biologist or group of biologists should see that this point is preserved as a natural reserve for the study of its wild life. Probably the point and part of its base are now government property. Even its base is sandy waste land that could be had at a reasonable price.

NEW AND LITTLE KNOWN UTAH PIPUNCULIDAE (DIPTERA)*

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Leafhoppers in Utah frequently are parasitized to an important extent by the maggots of big-eyed flies. The following report deals largely with *Pipunculus* flies collected in Utah canyons and apparently parasitizing the meadow and range leafhoppers which usually were abundant wherever the big-eyed flies were found in appreciable numbers. A number of the intermountain representatives of this important dipterous family appear to be undescribed.

***Pipunculus aberratus* n. sp.**

This species is near *nigripes* Lw., *semifasciatus* Cress. and *alternatus* Cress. but the antennae and ovipositor differ markedly from these species.

Female. Face and lower one-third of front silvery, upper two-thirds of front, vertex and upper occiput shining black; occiput cinereous below. Mouthparts chiefly brownish black, tip of labellum yellowish. Antennae black, third segment with a narrow acuminate point below (fig. 3).

Humeri and knobs of halteres black with cinereous pollen. Mesonotum and scutellum sub-opaque faintly shining, brownish black, lightly dusted with gray on the margins. Pleurae, metanotum, coxae and most of femora and tibiae cinereous. Trochanters with a faint yellowish tinge. Femora yellow apically; bases of tibiae yellow, their apices very narrowly so. Tarsi brownish yellow; the pulvilli and bases of claws yellow, apical one-half of claws black. Femoral and tibial spines developed but not strong. Middle coxae with two to three black hairs above near their apices, posterior trochanters with a short clump of hairs near the bases.

First abdominal segment silvery gray, other segments brownish gray pruinose posteriorly and on the sides, opaque brownish black anteriorly. Comb of first abdominal segment black, the bristles placed in a row across the segment (fig. 1). Base of ovipositor somewhat globular, dark brown with gray pollen; piercer reddish brown, long and slender, reaching to the base of the abdomen (fig. 2).

Wings hyaline, third costal section much shorter than fourth, stigma about one-half the length of third section (fig. 4). Ultimate section of fourth vein slightly sinuate, last section of fifth about equal to posterior cross vein; r-m cross vein beyond end of auxiliary vein and slightly behind middle of discal cell. Petiole of anal cell rather short.

Length: Wing 4.5 mm.; body 3.6 mm.

Holotype, female, Bluffdale, Utah, July 20, 1938 (G. F. Knowlton).

***Pipunculus aequus argyrofrons* n. var.**

This variety differs from other varieties of *aequus* in having the antennae brown to black. It differs from *aequus longipes* in having the femora distinctly black ringed; base of ovipositor more globose and less elongate. The piercer (fig. 5) extends to anterior edge of second segment. The abdomen of the female is also more subshining on the anterior margins of the segments, not entirely opaque as in *longipes*. The female differs from the type variety in having the front entirely silvery.

The second antennal segment of the allotype is brownish, while the third is black; the base of the ovipositor is shining black with a bright spot of yellow at the base of the piercer, from which arise the clump of yellow hairs. Piercing organ tapering, about as long as its base.

Holotype, male, Logan Canyon, Utah, June 14, 1938 (D. E. Hardy, A. T. Hardy); *allotype*, female, Logan Canyon, Utah, July 10, 1938 (Hardy, Hardy).

* Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

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Pipunculus aequus longipes n. var.

Female. Face, front and occiput entirely silvery except for shining black spot on vertex. Mouth parts, third segment of antennae, humeri and halteres bright yellow. Second segment of antennae and broad-based arista shining black; second segment with a long yellow bristle ventrally and numerous short black bristles dorsally (fig. 12).

Mesonotum and scutellum with brownish gray reclinate pubescence, ground color black; sides of mesonotum, pleurae and coxae cinereous pollinose. Mesonotum, scutellum and abdomen sparsely covered with short yellow hairs. Trochanters and rest of legs chiefly yellow, femora and tibiae with a blackish tinge dorso-medially, femora not distinctly black ringed. Femoral spines weak, posterior tibiae slightly bowed.

Abdomen (fig. 9) gray pruinose on sides and anterior half of each segment. Brush of first segment composed of long pale yellow-brown hairs. Base of ovipositor dark brown elongate, as long as strongly tapering yellow ovipositor. Ovipositor reaches to about the anterior edge of the fourth abdominal segment (fig. 11).

Wings hyaline, third costal section and stigma longer than fourth section (fig. 10). Ultimate section of fourth vein straight. Last section of the fifth vein slightly longer than posterior cross vein; anal cell with but a short petiole.

Holotype, female, Logan Canyon, Utah, June 14, 1938 (D. E. Hardy, A. T. Hardy).

Pipunculus alpinus Cresson

A female specimen which seems to belong to this species has the antennae more acuminate (fig. 13) and the ovipositor more stout and not quite so long (fig. 14) as that figured by Cresson; otherwise it fits his description.

Collected at Spring Hollow, Logan Canyon, Utah, August 7, 1938 (D. E. Hardy, A. T. Hardy). This specimen was taken in a rather unusual habitat, hovering above damp rocks around the edge of a large spring. Numerous specimens were seen flying close to the water.

Pipunculus apicalis n. sp.

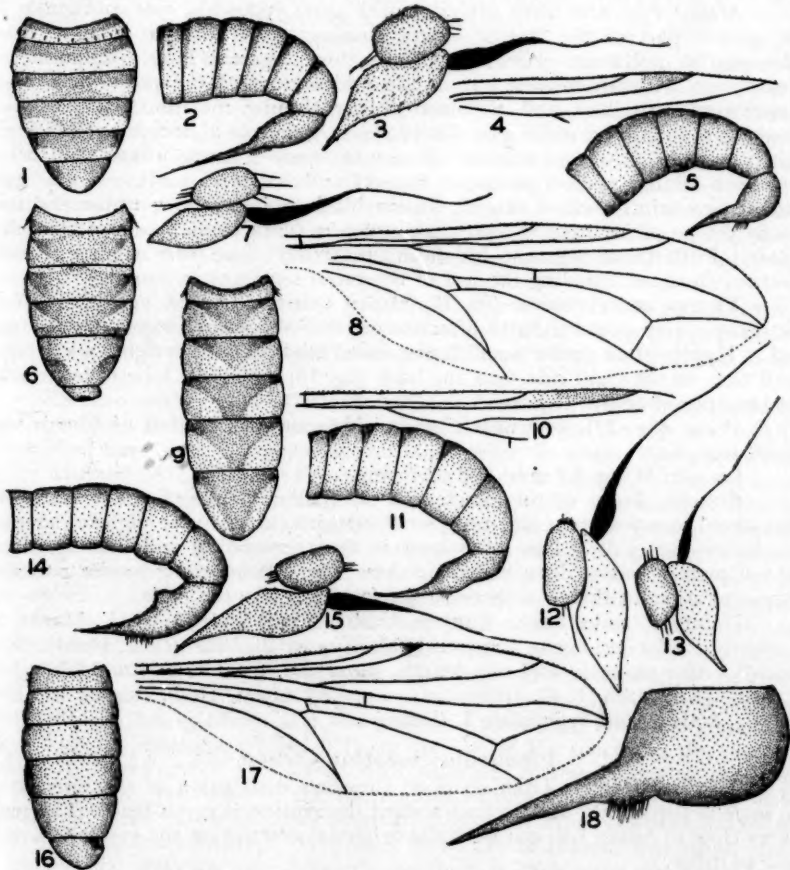
This species runs to *subnitens* in Cresson's key***, but differs in its large size, smaller apically cleft hypopygium, third costal section of wing longer than fourth, stigma very slightly dusky, halteres black and third segment of antennae black, short acute (fig. 7).

Male. Front and face silvery, front with a velvety black spot in center. Second segment of antennae black with one or two long hairs below and numerous bristles above; third segment black with white pubescence, short acute, white fringe on dorsal margin. Mouth parts yellow-brown to black. Occiput silvery gray pollinose.

Thorax sub-opaque on the dorsum, silvery gray pruinose on the sides, pleurae and metanotum. Scutellum sub-shining with two pairs of rather strong bristles on the posterior margin. Mesonotum and scutellum covered with dense yellow, recumbent, microscopic pubescence. Humeri grayish yellow; knobs of halteres black, stems yellow-brown. Coxae gray cinereous, median pair with several black bristles dorsally; trochanters sub-shining black, posterior pair with a small patch of short pale bristles near their bases. Femora and tibiae opaque black except for yellow apices of femora and bases of tibiae. Posterior femora shining on inner edges, tarsi brownish black, basitarsi yellowed basally. Femoral bristles rather weak, tibiae and tarsi clothed with short black hairs, one long bristle on dorsal edge of posterior tibiae; tarsal brushes dense yellow, some longer hairs at the apices of tarsal segments. Segment five with three long bristles apically. Tarsal claws and pulvilli yellow, tips of claws black.

*** Cresson, E. T. Studies in North American dipterology: Pipunculidae. Amer. Ent. Soc. Trans. 36:267-329. 1911.

Abdomen silver-gray pruinose on the sides, fasciated with gray along posterior margins of segments one to four, the fascia broader on the sides, the anterior half to three-fourths of each segment opaque black, fifth segment subopaque, the gray fascia extending for a short distance toward the middle from the sides (fig. 6); fifth segment with two indentations on each side toward the posterior margin. Hypopygium very short, subshining and with an apical cleft (fig. 6). Lateral comb of first segment composed of four to five black bristles.



Pipunculus aberratus n. sp. 1-4. *P. aequis argyrosfrons* n. var. 5. *P. apicalis* n. sp. 6-8. *P. aequis longipes* n. var. 9-12. *P. alpinus* Cresson. 13-14. *P. brachystigmaticus* n. sp. 15-18.

Wing (fig. 8) hyaline with an iridescent tinge, stigma very slightly tinged, but not distinctly brown.

Length: Body 3.8 mm.; wing 4.7 mm.

Holotype, male, Spring Hollow, Logan Canyon, Utah, July 17, 1938 (D. E. Hardy, A. T. Hardy).

Pipunculus brachystigmaticus n. sp.

The male of this species differs from *varius* Cress. in having the antennae long acuminate (fig. 15); hypopygium with a small cleft near the base of the right side (fig. 16); femora chiefly black and stigma not over one-fifth the length of the fourth costal section (fig. 17). The female runs to *nigripes* Loew and *horvathi* Kertz. The third antennal segment is longer, more acuminate; the mesonotum, scutellum and abdomen are shining; the tibiae more yellowed. The ovipositor is shorter than in *nigripes*, narrow and rather abruptly terminating its globular base (fig. 18); femoral spines not distinct.

Male. Face and front silvery, mouth parts yellowish, eyes contiguous for the greater part of the front. Vertex shining, upper occiput opaque black, sides grayish pollinose. Antennae black, third segment long pointed below. Mesonotum with an indentation in the middle toward the posterior margin. Mesonotum, scutellum and abdomen chiefly shining metallic black, sides of mesonotum lightly brownish gray dusted; first segment of abdomen opaque black, lightly grayish above and on sides of segment two. Pleurae, coxae and metanotum sub-shining grayish pruinose, humeri and halteres black, stems pale. Trochanters faintly yellow tinged; femora black, apices yellow; tibiae and tarsi chiefly yellow, tibiae banded with dark brown to black medially, more blackened below. Fifth tarsal segment brownish; posterior tibiae very slightly curved. Basitarsi elongate, equaling the rest of the tarsal segments in length.

Thorax and abdomen (fig. 16) almost destitute of pile, only sparse, pale microscopic pile present; hairs of comb on first abdominal segment short and dark. Hypopygium rather small, compressed slightly to the right; with but a small cleft on the right side near the base (fig. 16). Ventral lobe yellow, developed to apex of fourth segment.

Wing (fig. 17) brownish tinged, iridescent; last section of fourth vein almost straight.

Length: Wing, 4.2 mm; body 3.7 mm.

Female. Front shining black with two narrow stripes of pollen extending from above antennae part way up the eye margins. Front very slightly indented just below the ocelli. Base of ovipositor short, rounding and shining black; narrow piercer yellow, longer than its base (fig. 18) reaching to the posterior margin of segment three. Otherwise the female is like the male.

Holotype, male, Logan Canyon, Utah, August 7, 1938 (D. E. Hardy, A. T. Hardy); **allotype**, Logan Canyon, Utah, August 10, 1938 (D. E. Hardy, G. S. Stains). Also six male and one female, *paratypes*, from Franklin, Idaho, July 17, 1937 (Knowlton, F. C. Harmston); Logan Canyon, Utah, August 25, 1938 (Hardy, Stains) and September 4 (Stains).

Pipunculus sororius Cresson

The females of a Utah series fit Cresson's description of this species; as the male is apparently undescribed a short description is given here. The male is very close to *fuscus* Lw. but from the original description the genitalia would seem to differ.

Male. Eyes contiguous for the greater part of the front. Femora more blackened, only the bases and apices yellow; mid-coxae with a group of bristles apically above. Sides of abdomen straight or nearly so; all segments about equal in width. First abdominal segment gray pollinose, comb yellowish gray; other segments shining, opaque black on anterior edges, gray on the sides. Fifth segment about one and one-half times as long as fourth; hypopygium compressed to the right, slightly more than half as long as fifth, with an apical cleft and a small scarcely noticeable apical keel.

Wing brownish iridescent tinged, the stigma and second costal section longer than third section. Last section of fourth vein sinuate, ultimate section

of fifth slightly shorter than posterior cross vein; r-m crossvein opposite end of auxiliary vein, and at about the basal one-fourth of discal cell.

Collected in Spring Hollow, Logan Canyon, Utah, August 7, 1938 (D. E. Hardy, A. T. Hardy).

This species was taken in a hydrophitic environment in association with large swarms of Mycetophilidae which were flying in the shade of an overhanging creek bank.

CORRECTIONS TO THE GAHAN AND ROHWER LECTOTYPES OF PROVANCHER'S ICHNEUMONIDAE (HYMENOPTERA)

BY HENRY K. TOWNES, JR.,
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In June, 1938, I was able to spend eight days at the Public Museum of Quebec studying the Provancher collection of Ichneumonidae. Mr. Pierre-Georges Roy (Director of the Museum), Mr. Paul Rainville (Assistant Director), and Mr. Noel-M. Comeau (Curator of Insects), were very cordial and gave me facilities and help that made it possible to accomplish much more than could otherwise have been done. The work was further facilitated by the technical assistance of Mrs. Townes. During my stay I was able to compare all of the ichneumonid types with the collection of some seven thousand specimens I took to Quebec with me. The results of these comparisons will be published in later papers.

In the course of this study, I found that some of Gahan and Rohwer's designations of lectotypes* were incomplete or incorrect. This paper is an attempt to supplement and correct Gahan and Rohwer's type designations in the Ichneumonidae.

The Provancher Insect Collection is now housed in the new and modern building of the Public Museum of Quebec. While I was there it was still in the original cases and in somewhat the same order in which Provancher had left it. However Abbé Huard, Provancher's successor as curator in the museum, had made some changes in the original arrangement. The specimens of Ichneumonidae were in two lots, distinguished by the color of the labels. One lot (known as the First Collection) had determination labels on pale blue paper, while the determination labels of the other lot (known as the Second Collection) were on white labels with a printed double red border. The First Collection was purchased from Provancher in October, 1877. The Second Collection was acquired from his estate two years after his death. Since the First Collection originally contained mostly if not solely duplicate specimens, most of the types are to be found in the Second Collection. Only the first specimen in a series is labeled and this specimen also bears a small numbered label, in most cases yellow with the numbers printed. There are lists of the species in the two collections in Provancher's own hand, with numbers corresponding to those on the yellow tags. For some of the species the locality is given in these lists. Occasionally there are additional numbered labels of other colors, but locality labels are practically lacking. Whenever there are additional specimens, these are unlabeled. Only the first (labeled) specimen in each series can be regarded as authentically determined and it is the first specimen that in nearly all cases has been selected as lectotype. The other specimens are often not of the same species as the first in the series. At present (November, 1938), the Provancher Hymenoptera lectotypes are being transferred to modern cases and labeled according to the paper of Gahan and Rohwer and the corrections published here.

Sometime between 1894 and 1910, Abbé Huard selected duplicates of species represented by more than one specimen in the combined first and second collections and took them to the Séminaire de Chicoutimi, about 115 miles north

*Canadian Ent. 1917-18. 49:298-308, 331-336, 391-400, 427-433; 50:28-33, 101-106, 133-137, 166-171, 196-201.

of Quebec. Huard spent most of his summers at Chicoutimi and probably took a number of specimens from Quebec on each of several trips. It may be that where the same species was represented in both the first and second collections, Huard, in some cases took the probable type to Chicoutimi and left another less authentic specimen in Quebec. M. l'abbé Fournier through his friend Professor Larouche, the curator at Chicoutimi, secured a list of the Ichneumonidae in this collection for me. There are about 210 species represented by about 250 specimens in the collection. Of these, about 86 are species described by Provancher. Except for *Thalessa quebecensis* and *Ichneumon saguenayensis*, there are no species in Chicoutimi of which the lectotype has not already been designated. I borrowed these two species from Chicoutimi and found that the specimen of *Ichneumon saguenayensis* fits the description so well that it is probably the type, while the specimen of *Thalessa quebecensis* is too small and dark to be made a lectotype, although it is of the same species (*Megarhyssa nortoni*) as the specimen on which the original description was based.

I was told that in 1879 Provancher gave to the College of Levis (across the St. Lawrence River from Quebec) a collection of duplicates. I could learn nothing more about this collection. Provancher's list indicates that the 1877 collection contained a series (averaging three or four) of each species. As there are now very few duplicates, at least of Hymenoptera, one supposes that they went to Levis or Chicoutimi. Other possible locations of missing types are in the collections of Burque in Saint Hyacinthe and Bégin in Sherbrooke. Both of these men were correspondents of Provancher. Laval University in Quebec is said to have none of the Provancher material.

Among the lectotypes listed below, there are eleven which are designated for the first time. In the case of five of the species, Gahan and Rohwer selected a lectotype that evidently does not fit the original description. For eleven species they do not give the correct sex of the lectotype, and for twenty the data concerning the type are incomplete or inaccurate. Eight lectotypes have been so seriously damaged since Gahan and Rohwer saw them that it seems wise to report their present condition. In each case the complete data on the lectotypes are given below. The reader may ascertain the nature of the errors corrected by comparing the present data with those in Gahan and Rohwer's paper. Although I do not approve of giving a type designation under a genus other than that used in the original description, I follow Gahan and Rohwer's practice of using the name that Provancher used in his later works in order that this paper may be more easily used as a supplement to theirs. I have added the original name when this differs from the one used.

LIST OF LECTOTYPES

Amblyteles perluctuosus. Type.—Female, yellow label 172, 2d Coll. Pub. Mus. Quebec. Head missing.

Atractodes scaphiphorus. Type.—Not located. Lectotype of Gahan and Rohwer (yellow label 307, 2d Coll. Pub. Mus. Quebec) does not fit the description.

Banchus ferrugineus. Type.—Female, yellow label 385, 1st Coll. Pub. Mus. Quebec.

Banchus flavovariegatus. Type.—Male, yellow label 311, 2d Coll. Pub. Mus. Quebec.

Banchus formidabilis. Type.—Female, yellow label 378, 1st Coll. Pub. Mus. Quebec. Antennae at apex, middle tarsi at apex, and entire right hind tarsus missing.

Banchus pallescens. Type.—Female, yellow label 386, 1st Coll. Pub. Mus. Quebec. Left antenna at fifth joint, left fore leg, and right hind leg missing.

Banchus polychromus. Type.—Male, yellow label 1551 and white label 400, 2d Coll. Pub. Mus. Quebec.

Bassus costalis. Type.—Not located. Neither the lectotype of Gahan and Rohwer (yellow label 453, 1st Coll. Pub. Mus. Quebec) nor another specimen labeled *Bassus costalis* (yellow label 351, 2d Coll. Pub. Mus. Quebec) fits the description.

Bassus dorsalis. Type.—Female, yellow label 1247 and blue label 165, 2d Coll. Pub. Mus. Quebec. Apices of antennae missing.

Bassus humeralis. Type.—Male, yellow label 448, 1st Coll. Pub. Mus. Quebec. Provancher's description of the "Female" applies to this male specimen. Abdomen missing. Described as *Tryphon humeralis*.

Bassus ichneumonoides. Type.—Female, yellow label 352, 2d Coll. Pub. Mus. Quebec.

Cryptus spissicornis. (Addit. 1886, p. 68 not Suppl. 1888, p. 361) Type.—Female, yellow label 1203 and blue label 22, 2d Coll. Pub. Mus. Quebec. Labeled *Cryptus crassicornis*.

Cteniscus rufus. Type.—Female, yellow label 433, 1st Coll. Pub. Mus. Quebec.

Ctenopeima sanguinea. Type.—Female, yellow label 323, 2d Coll. Pub. Mus. Quebec. Described as *Tryphon sanguineus*.

Eclytus pleuralis. Type.—Not located. Neither the lectotype of Gahan and Rohwer (yellow label 410, 1st Coll. Pub. Mus. Quebec) nor another specimen labeled *Eclytus pleuralis* (yellow label 326, 2d Coll. Pub. Mus. Quebec) fits the description. Described as *Orthocentrus pleuralis*.

Euxorides vancouveriensis. Type.—Female, yellow label 1556 and white label 424, 2d Coll. Pub. Mus. Quebec. Lacks head and prothorax.

Exochus scitulus. Type.—Female, yellow label 439, 1st Coll. Pub. Mus. Quebec.

Hoplismenus impar. Type.—Female, yellow label 168, 2d Coll. Pub. Mus. Quebec.

Ichneumon absconditus. Type.—Male, yellow label 1210 and blue label 202, 1st Coll. Pub. Mus. Quebec. Right antenna broken, left fore wing missing, thorax crushed but complete, three basal segments of right hind tarsus present, the rest of the hind tarsi missing.

Ichneumon magdalenensis. Type.—Male, labeled *Ichneumon magdalenensis* on white label in Provancher's handwriting and *Cratichneumon magdalenensis* on white label in the handwriting of some one else.

Ichneumon ontariensis. Type.—Male, yellow label 1191 and pink label 30, 2d Coll. Pub. Mus. Quebec. Provancher mistook sex.

Ichneumon saguenayensis. Type.—Male, yellow label 1896 and determination label with double red border, collection of the Séminaire de Chiboutimi. Flagella beyond the third segment, abdomen beyond the fifth segment, and undersides of the remaining segments except the petiole all missing. Fourth and fifth tergites glued on pin.

Lampronota nigripes. Type.—Female, blue label 593, 2nd Coll. Pub. Mus. Quebec.

Limneria rufipes. Type.—Female, yellow label 521 and name label *Limneria mellipes* Prov., 2d Coll. Pub. Mus. Quebec. Proved by Provancher's catalogue. Antennae broken near middle and abdomen missing.

Limneria sessilis. Type.—Female, yellow label 348, 1st Coll. Pub. Mus. Quebec. Antennae broken before middle.

Meniscus ashmeadi. Type.—Female, yellow label 1651 and small white label with "6" in pencil, 2d Coll. Pub. Mus. Quebec. Glued to square point. "Fla." in corner of name label.

Mesochorus pleuralis. Type.—Male, yellow label 367, 1st Coll. Pub. Mus. Quebec. Provancher mistook sex. Described as *Plectiscus pleuralis*.

Mesoleius antennatus. Type.—Female, yellow label 338, 2d Coll. Pub. Mus. Quebec. Abdomen missing.

Mesoleius niger. Type.—Male, yellow label 933, 2d Coll. Pub. Mus. Quebec.

Mesoleptus barbatus. Type.—Male, yellow label 1230, 2d Coll. Pub. Mus. Quebec. Abdomen missing. Provancher mistook sex.

Mesoleptus canaliculatus. Type.—Male, yellow label 322, 2d Coll. Pub. Mus. Quebec. Abdomen missing. Described as *Paniscus canaliculatus*.

Mesoleptus laetus. Type.—Male, yellow label 319, 2d Coll. Pub. Mus. Quebec. Antennae and abdomen missing.

Odontomerus canadensis. Type.—Female, without labels. Lacks right antenna. Male, allotype, yellow label 426, 2d Coll. Pub. Mus. Quebec.

Paniscus albotarsatus. Type.—Male, yellow label 288, 2d Coll. Pub. Mus. Quebec. Antennae and tip of abdomen missing.

Paniscus albovariegatus. Type.—Male, yellow label 287, 2d Coll. Pub. Mus. Quebec. Genitalia mounted on slide.

Phaogenes huarti. Type.—Female, yellow label 411, 1st Coll. Pub. Mus. Quebec. Labeled *Posocentrus huarti*. The Gahan and Rohwer lectotype (yellow label 328, 2d Coll. Pub. Mus. Quebec) does not fit the description. Described as *Posocentrus huarti*.

Phaogenes recticaudus. Type.—Female, yellow label 1197 and blue label 66, 2d Coll. Pub. Mus. Quebec. Abdomen broken off and glued on label.

Phaogenes tuberculifrons. Type.—Female, yellow label 199, 2d Coll. Pub. Mus. Quebec. Described as *Phygadeuon tuberculifrons*.

Phygadeuon acaudus. Type.—Female, yellow label 1047, 2d Coll. Pub. Mus. Quebec. Complete but pin obliterates some of the characters.

Phygadeuon autumnalis. Type.—Female, yellow label 940, 2d Coll. Pub. Mus. Quebec. Thorax and part of legs on pin, the rest missing.

Phygadeuon cephalicus. Type.—Male, yellow label 663, 2d Coll. Pub. Mus. Quebec. Hind legs missing.

Phygadeuon constrictus. Type.—Male, yellow label 718, 2d Coll. Pub. Mus. Quebec. Abdomen and hind legs missing.

Phygadeuon fasciatus. Type.—Female, yellow label 1182 and blue label 18, 2d Coll. Pub. Mus. Quebec.

Phygadeuon impressus. (Nat. Canad. 1875 7: 112 and 183) Type.—Male, yellow label 213, 2d Coll. Pub. Mus. Quebec. Described as *Ischnus impressus*.

Phygadeuon jocosus. Type.—Female, yellow label 1183 and blue label 34, 2d Coll. Pub. Mus. Quebec. Labeled *Phygadeuon potens* (as this species is called in the key, page 47). Gahan and Rohwer's lectotype (yellow label 1180 and old rose label 205, 2d Coll. Pub. Mus. Quebec) does not fit the description.

Phygadeuon lechevallieri. Type.—Female, yellow label 662, 2d Coll. Pub. Mus. Quebec. Antennae, legs, left wings, and abdomen missing.

Phygadeuon maculatus. Type.—Female, yellow label 202, 2d Coll. Pub. Mus. Quebec. Antennae missing.

Platylabus aciculatus. Type.—Female, yellow label 1187 and blue label 97, 2d Coll. Pub. Mus. Quebec. Lacks hind legs beyond femora. Described as *Phygadeuon aciculatus*.

Platylabus cineticornis. Type.—Female, yellow label 1188 and blue label 100, 2d Coll. Pub. Mus. Quebec.

Platylabus crassicornis. Type.—Female, yellow label 1186 and blue label 96, 2d Coll. Pub. Mus. Quebec.

Platylabus mitralis. Type.—Female, yellow yabel 1185 and blue label 52, 2d Coll. Pub. Mus. Quebec.

Platylabus signatus. Type.—Female, yellow label 243, 1st Coll. Pub. Mus. Quebec. Described as *Phygadeuon signatus*.

Podogaster sulcatus. Type.—Female, yellow label 1225 and blue label 235, 2d Coll. Pub. Mus. Quebec. Right antennal flagellum and abdomen missing.

Polyblastus gaspesianus. Type.—Male, yellow label 461, 2d Coll. Pub. Mus. Quebec. Antennae beyond first flagellar segment missing. Provancher mistook sex. Described as *Tryphon gaspesianus*.

Stilpnus canadensis. Type.—Male, yellow label 254, 1st Coll. Pub. Mus. Quebec. Antennae broken at apex; abdomen, right fore wing, and all of the legs except one front one broken off; abdomen and part of legs glued on yellow label.

Tryphon tuberculifer. Type.—Male, yellow label 1237, 2d Coll. Pub. Mus. Quebec. Labeled "*Tryphon tuberculiferus* Prov."

A CORRECTION IN THE TRYPHONINAE (HYMENOPTERA: ICHNEUMONIDAE) IN DALLE TORRE'S CATALOGUS HYMENOPTERORUM.

BY J. CHESTER BRADLEY,

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C. G. de Dalle Torre (Catalogus hymenopterorum, vol. 3, p. 24) makes the following erroneous entry:

"*Plectiscus pleuralis* (Cress.) Davis—♀—Am. New Jersey.

Tryphon pleuralis Cresson, Proc. Entom. Soc. Philadelphia. III. 1864, p. 275 n. 5, ♀.

Plectiscus pleuralis Davis, Trans. Amer. Entom. Soc. xxiv. 1897, p. 245 ♀."

According to his own statement the species to which Davis had reference in the above citation, in his review of the ichneumonid sub-family Tryphoninae, was *Plectiscus pleuralis* Provancher, an altogether different insect from *Tryphon pleuralis* Cresson.

Previously Davis (Some notes from a study of the Provancher collection of Ichneumonidae. Proc. Acad. nat. sciences, Philadelphia, 1894, p. 188), basing his statement on examination of Provancher's type, stated that "*Mesochorus pleuralis* seems to be a *Plectiscus* as Provancher had it at first".

Davis (Review of the ichneumonid subfamily Tryphoninae. Trans. Amer. Ent. Soc. 1897. 24:323) transferred the Cressonian species which Dalle Torre refers to in the entry above quoted, *Tryphon pleuralis* Cresson, 1864, to the genus *Symphobus*, and Dalle Torre has re-entered in under the genus *Symphobus* on page 352 of volume three of his catalog, where he has given the correct reference to the generic transfer by Davis.

Dalle Torre further (*loc. cit.* p. 24) in entering *Plectiscus pleuralis* Provancher, changed the name of that species to *provancheri* D. T., on the grounds that *Plectiscus pleuralis* Provancher, 1875, is preoccupied by *Tryphon pleuralis* Cresson, 1864, = *Plectiscus pleuralis* (Cresson) Davis; but since the latter species was transferred to *Symphobus*, not *Plectiscus*, by Davis and stands in literature as a member of that genus, Provancher's species name is nevertheless available and must be adopted.

It is necessary to change Dalle Torre's catalog as follows:

On page 24: strike out the references under the heading "*pleuralis* (Cresson) Davis".

Strike out the heading "*provancheri* D. T." and substitute the heading "*pleuralis* Provancher". Under this heading after the fifth entry add: "*Plectiscus pleuralis* Davis, Trans. Amer. Entom. Soc. xxiv. 1897. p. 245."

As Mr. Townes possesses specimens of both the species under discussion which he has carefully compared with the types involved, and has new information concerning the generic position of each, he has kindly drawn up a full statement of their synonymy to append to these notes.

THE CORRECT GENERIC POSITION AND SYNONYMY OF *SYMPHOBUS PLEURALIS* (CRESSON) AND OF *PLECTISCUS PLEURALIS* PROVANCHER (HYMENOPTERA: ICHNEUMONIDAE).

BY HENRY K. TOWNES, JR.,
Cornell University, Ithaca, N. Y.

The genotype of *Symphobus* is *Tryphon pleuralis* Cresson, and that of *Oetophorus* is *Mesoleius stretchii* Cresson. I have studied the types of each of these species and find them congeneric. *Symphobus* was described originally without included species and *pleuralis* is the first species to be referred to it. *Pleuralis* has pectinate claws and in that respect does not fit the original description of *Symphobus*. In the opinion of some authors, this would preclude the possibility of its being selected as genotype of *Symphobus*, but opinion 46 of the International Commission on Zoological Nomenclature states that the first species included in a genus published originally without included species becomes *ipso facto* the type. The use of "*ipso facto*" excludes any other consideration in fixing the genotype.

***Oetophorus* Foerster**

Oetophorus Foerster, Verh. naturh. Ver. preuss. Rheinl. 1868. 25:196.

Symphobus Foerster, Verh. naturh. Ver. preuss. Rheinl. 1868. 25:199 (new synonymy).

***Oetophorus pleuralis* Cresson, n. comb.**

Tryphon pleuralis Cresson, Proc. Ent. Soc. Philadelphia 1864 3: 275 ♀.

Symphobus pleuralis Davis, Trans. Amer. Ent. Soc. 1897. 24:323 ♀.

Plectiscus pleuralis Dalla Torre, Cat. Hymen. 1901. 3:24 ♀ (not Provancher)

Symphobus pleuralis Dalla Torre, Cat. Hymen. 1901. 3:352 ♀.

***Astiphromma pleuralis* Provancher, n. comb.**

Plectiscus pleuralis Provancher, Natural. canad. 1875 7:330 ♂ (not ♀).

Mesochorus pleuralis Provancher, Natural. canad. 1879 11:209 ♂ (not ♀).

Mesochorus pleuralis Provancher, Natural. canad. 1883. 14: 3 ♂ (not ♀).

Mesochorus pleuralis Provancher, Faune ent. Canada Hymen, 1883 p. 381 and 791 ♂ (not ♀).

Plectiscus pleuralis Davis, Proc. Acad. Nat. Sc. Philadelphia 1894 p. 188.

Plectiscus pleuralis Davis, Trans. Amer. Ent. Soc. 1897 24: 245 ♂ (not ♀).

Plectiscus provancheri Dalla Torre, Cat. Hymen. 1901 3:24 ♂ (not ♀).

Mesochorus orcae Ashmead, Proc. Wash. Acad. Sc. 1902. 4:239 ♂ (new synonymy).

NOTES ON THE IDENTITY OF CERTAIN FORMS OF *EUBAPHE*

BY ALEX. K. WYATT,
Chicago, Ill.

Eubaphe immaculata was described by Tryon Reakirt in 1864 (Proc. Ent. Soc. Phil. II., 372) and his description is more or less inadequate as are almost all original descriptions in this genus. However, the type is in the Strecker Collection at the Field Museum of Natural History in Chicago and represents a species that is not at all rare in the Chicago area. It is larger, broader winged, and entirely distinct from any of the forms of the *aurantiaca* group. It seems restricted to dense woods that are wet in springtime, and when disturbed the moths seek shelter in heavy underbrush. Quite the opposite is true of the *aurantiaca* forms which appear to favor open fields and sunshine. Females are extremely rare but have been taken and eggs secured therefrom

reared through to maturity. Relatively few adults were secured because of the pronounced inclination of the caterpillars to hibernate.

With the description of *immaculata*, Mr. Reakirt referred to several specimens that "might perhaps be considered as a variation of *rubicundaria* or even *ferruginosa*" and further, "Should these prove to be new, I would propose for them the name of *tri-maculosa*." There are two types of *trimaculosa* in the Strecker Collection. The first of these bears three labels, a white label without border reading "Trimaculosa, Reak. Phila Pa.", a red bordered label reading "C. Trimaculosa, Reak. Orig. type. Coll. Reak." and a small white tag bearing the number "25". This specimen unquestionably is the same species as *immaculata*. It is rather small (expanse 1.04 inches) and somewhat rubbed, primaries not noticeably marked except slightly darker along inner margin. The secondaries have a faint pinkish tinge. Black markings on secondaries consist of a double spot near anal angle and another single spot near apex. No discal spot is present.

The second *trimaculosa* "type" bears only one label, red bordered, with wording the same as the red bordered label of the first type.

This specimen is of a pink or rose color over all, primaries somewhat worn; no apparent spots or markings; secondaries with a double or irregular blackish mark near anal angle and another single mark near apex; no discal spot; expanse 1.06 inches.

Apparently the only difference between the two types lies in the relatively deeper pink color, yet this deep color is so entirely foreign to the range of variation in *immaculata* that it cannot be considered as a synonym without reservation.

Back in the year 1927, July 9 to 16, on a short vacation sojourn at Rhineland, Wisconsin, the writer was fortunate enough to capture quite a series of a *Eubaphe* species that was flying most freely in a field of long grass among scattered sumach shrubs in almost open territory. A single female was taken on the last afternoon and eggs therefrom later reared to maturity. A few specimens of the same species were captured July 23 to 30 of the same year at Keewadin, Michigan. The captured males varied considerably, while those later reared were quite constant. Female progeny varied more, but not exceptionally so. More recently eggs were received from Dr. A. E. Brower of Bar Harbor, Maine, and a few from Miss Marion Smith of Freedom, New Hampshire. These were reared and proved to be the same as the Wisconsin form. Dr. Brower stated that the moths were flying along the edge of open swamp land. It is this form that is represented by the second type of *trimaculosa*.

Eubaphe ferruginosa was described by Walker in 1855 (Cat. Brit. Mus., Lep. Het. II, 535, *Crocota*) from specimens from St. Martin's Fall, Albany River, Hudson's Bay. The description follows: "Ferruginous, paler beneath. Abdomen pale ferruginous with a row of dorsal black dots. Hind wings pale ferruginous, with a blackish dot in the disk, and two or three blackish spots along the border. Length of the body, $3\frac{1}{2}$ -4 lines; of the wings 10-11 lines."

In 1926, Barnes and Benjamin (Pan Pac. Ent. III, 16), on the strength of a specimen compared with Walker's type of *ferruginosa* and with the two types of *trimaculosa*, assigned the latter as a synonym of *ferruginosa* and suggested that *immaculata* remain as a form of *ferruginosa*. The inference would be that the name *immaculata* should apply to the form with unmarked secondaries. This would be improper from the writer's viewpoint, because of the variability of the two forms.

It seems reasonable to assume that the Wisconsin-Maine form should be called *ferruginosa*. A detailed description of this and of *immaculata*, follows.

immaculata. Males: Ground color yellow, overlaid on primaries in fresh specimens with dark, coffee brown scales that predominate over basal two-thirds.

Occasionally the darker shades vary and appear in three more or less evident transverse bands approximately parallel to the outer margin, the middle band the widest. White spots appear in the submedian interspace in about one third of the specimens; these spots are usually small, one or two in number and are sometimes ringed with black. In one unusual specimen, a longitudinal white blotch one half the length of the wing replaces the customary two small spots. The secondaries are a shade paler than the primaries. Markings, when present, consist of a discal spot varying in size from a pin point to a distinct black lunule across the end of the cell. Submarginal markings comprise an irregular blotch near anal angle and a smaller spot half way between this blotch and the apex. Only three of thirty-nine specimens have immaculate secondaries, others vary, the darkest having the large blotch about half the length of the outer margin and the smaller spot occupying about one-third of the remainder. Most specimens have the fringe concolorous with the wing, but twenty-five per cent show a pronounced dusky fringe.

immaculata. Females: Primaries vary in ground color from a pale brown to a deep Vandyke brown, evenly colored, except that some show a darker post median band. All show a dark discal spot varying in size and prominence. Only one of eleven specimens is without a white spot in the submedian interspace, all others show at least two, of which the inner, about half way to the outer margin, is the larger. One specimen has an extra spot nearer the base, additional white spots just above the customary two, and another spot near apex. The white spot near apex is present in three others. The secondaries have ground color a pale chrome orange, discal spots all dark, prominent. Irregular submarginal spots pronounced, varying little. Fringes dusky.

Expanse. Males, 1.10 to 1.26 inches; females, 1.20 to 1.34 inches.

ferruginosa. Males: Ground color of primaries varies from a pale brown to a Vandyke brown, usually with some paler shades, always with a pink or old rose tinge. The paler shades form indistinct bands across the wing. Only three out of fifty show a single white spot in submedian interspace. Only one shows no sign of a discal spot. Secondaries are a pale salmon pink or flesh color, some a trifle darker and showing a shade more pink. A series of bred specimens that varied little had hind wings almost immaculate. Excluding these, only nine out of twenty-six showed no discal spot on secondaries and only two of these were entirely immaculate. Marginal markings vary from one or two small spots to an almost solid band. Fringes quite often dusky.

ferruginosa. Females: Color of primaries ranges from pale brown ochre to indian red (dark red brown), usually quite even. Discal mark in all specimens, and a dark post median band evident in some. White spots in the submedian interspace appear as follows: of 22 specimens, 3 have no spots, 4 have one spot and 15 have two or more. The extreme has a small spot in the cell, a large oval spot in submedian interspace, and a row of three parallel to outer margin. The color of secondaries is chrome orange, pale to dark; discal marks pronounced; marginal marks pronounced, small to large. The palest specimen is like the darkest *immaculata*. *Expanse*; Males, 1.04 to 1.16 inches; females, 1.10 to 1.18 inches.

The wings of *immaculata* appear to be broader than those of *ferruginosa* and careful measurements verify this, though the difference is slight. Little stress can be laid on this however, for measurement is difficult at best, and specimens in this genus are quite apt to be incompletely developed.

Summarizing, we may say that *immaculata* is yellow with coffee brown shadings and no pink; *ferruginosa* is pale brown to dark red brown, always with a pink tinge: *immaculata* is larger; 1.10 to 1.26 inches in males, 1.20 to 1.34 inches females; *ferruginosa* is smaller, 1.04 to 1.16 inches in males, 1.10 to 1.18 inches

females; *immaculata* males often with white spots in primaries; *ferruginosa* males rarely with white spots in primaries; *immaculata* males with secondaries sometimes immaculate, markings when present usually limited in extent; *ferruginosa* males with secondaries sometimes immaculate, markings when present tending to be more extensive than in *immaculata*, occasionally forming a complete marginal band.

A small series of bred specimens from Plainfield, New Jersey, received from Mr. Otto Buchholz, agrees with the above detailed description of *ferruginosa*, even approximating the extent of variation. These specimens, however, are much smaller, the males expanding .88 to 1.00 inches and the females .94 to 1.08 inches. They are best placed with *ferruginosa* for the same reason that *diminutiva* and *rosa* have been made synonymous with *rubicundaria*.

Eubaphe quinaria was described by A. R. Grote in 1863 (Proc. Ent. Soc. Phil. II, 30, *Crocota*). This description included an illustration, Plate II, fig. 2, referring to it as a female, one of the few instances in the literature of the genus in which sex is mentioned. The writer has seen the type and has no hesitation in referring it definitely as a heavily white spotted female of *ferruginosa* Wlk. The heavy body and the oblique outer margin of primaries, stressed by Packard (Proc. Ent. Soc. Phil., III., 97), are normal features of females in this genus. No male has been seen that could be even remotely associated with *quinaria* under the same name. It should not be considered a form of *aurantiaca*.

Choriona Reakirt, the types of which are also in Chicago, must remain as a synonym in the *aurantiaca* group which will be considered on a later occasion.

In view of the facts set forth, the following arrangement of names is recommended:

- ferruginosa* Wlk.
- syn. *trimaculosa* Reak. (partim)
- form *quinaria* Grt. ♀
- ♂ *immaculata* Reak.
- syn. *trimaculosa* Reak. (partim)

BOOK NOTICES

Biological Survey of the Mount Desert Region. Part VI. Insect Fauna. By William Proctor. Wistar Institute of Anatomy and Biology, Philadelphia. 496 pp., 12 illustrations and frontispiece. (private distribution)

This well-bound volume is a check list of the insects and arachnids of Mount Desert Island, which lies off the coast of Maine. This island is situated on the southern edge of the Boreal Region and the northern line of the Austral Transitional Zone. The topography of the island offers the collector a variety of habitats including mountains and valleys, and ponds, bogs and heaths. Added to this the modifying effect of the ocean eliminates, to a large extent, extremes of temperature, making the island an area where arctic plants mix with plants of the Canadian Zone and the Southern Coastal Plain. Since insect life and the flora are interdependent, the island is almost a unique collecting ground.

During the survey, 5465 species of insects and arachnids have been collected and identified, many of the identifications being made by specialists. The number of species recorded from the different orders are proportionate to the size and prominence of the order. Thus 1374 species of Lepidoptera representing 553 genera and 47 families, and 1370 species of Diptera representing 469 genera and 64 families, are recorded, while of the Collembola a single species is recorded.

No attempt has been made to collect in the smaller groups where collecting is of a special nature. Supplementary lists including these special groups are to be published at a later date.

An interesting feature of this check list is the inclusion of notes on how and where to collect certain species. An index to genera is included.

Although this check list deals with a relatively small area, the nature and situation of this area are such that many of the records should prove of particular interest to those working with some of these groups.

R. H. Ozburn.

La Biologie des Orthopteres. By Lucien Chopard. (Series A. XX, *Encyclopedie Entomologique*) P. Lechevalier, Editeur, Paris VI, France. 541 pp., 453 fig., 5 plates. 250 fr. (paper cover).

The author, in assembling the wealth of material contained in this volume, has practically disregarded all taxonomic or morphological questions. Since as the author points out, this general field has only been touched upon by Max Beier in his "Biologie der Tiere Deutschlands" and by Uvarov in his "Locusts and Grasshoppers", over 1,000 references, many in periodicals difficult to procure, had to be consulted.

The first six pages devoted to introductory remarks include a brief classification of the Orthoptera. The first chapter is devoted to geographical distribution, and includes such topics as faunal regions, discontinuous, geological and ecological distribution, and insular faunas. This is followed by a chapter on special habitats and the modifications of forms adapted to these conditions—from desert to myrmecophilous forms. Chapter three deals with Orthoptera which construct shelters in soil or amongst foliage. The next three chapters take up at length various phases of reproduction and development other than embryonic. Chapter seven discusses the mechanism, character, variation and significance of sounds amongst Orthoptera. Reflexes such as autotomy, regeneration, and for defensive purposes, reactions to environmental factors such as phototropism and thermotropism, and color and mimicry form the basis of chapters eight to eleven. This is followed by a chapter on variation and heredity. The last chapter deals with the rudiments of social life amongst the Orthoptera. An appropriate bibliography is included with each of the chapters.

An index to authors cited, a host index of parasitic and commensal forms, and a systematic index add to the value of the volume.

Although much of this material may be available in other references, this volume should prove both convenient and useful on questions pertaining to the biology of the Orthoptera.

R. H. Ozburn.

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